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MISCELLANEOUS PUBLICATION No. 34

WASHINGTON, D. C. APRIL, 1929

UNITED STATES ANIMAL HUSBANDRY EXPERIMENT FARM BELTSVILLE, MARYLAND

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This publication is a brief discussion of experiments in animal husbandry, including breeding, feeding, and management of domestic farm animals and poultry, being conducted at Uncle Sam's animal-husbandry "proving ground" at Beltsville, Md., 13 miles from the Nation's Capital. Visitors are always welcome.

UNITED STATES ANIMAL HUSBANDRY EXPERIMENT FARM, BELTSVILLE, MD.

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and
Ben F. Brandon, *Animal Husbandman and Farm Superintendent, Bureau of Animal Industry*

Recognizing the need of a near-by proving ground for conducting experiments in animal husbandry, the United States Department of Agriculture purchased, in 1910, a 500-acre tract near Beltsville, Prince Georges County, Md., and divided it into two experiment farms, one for dairy cattle, the other for beef cattle, horses, sheep, goats, swine, and poultry.

The latter farm was augmented in 1926 by an additional purchase and now includes more than 1,300 acres, which are being devoted to scientific and practical research in animal husbandry—the breeding, feeding, and management of domestic farm animals and poultry.

SIGNIFICANCE OF FARM

The significance and value of this farm in the program of work of the department are evident. It provides a proving ground equally useful for testing highly technical theories of animal husbandry and for demonstrating the more practical phases of livestock production.

Its specialized equipment, its trained personnel, and its uniform animals of known ancestry, all centralized near the headquarters of officers in charge (fig. 1), make it an invaluable factor in the Government's search for more efficient methods of livestock production.

The tract was originally part of the well-known Birmingham Manor, covering thousands of acres, belonging to the Snowden family. The present dwelling was built about 1785 for John C. Herbert, of Revolutionary fame.

VISITORS

Thousands of visitors (fig. 2) come to the farm each year to study the projects under way, to observe the well-bred stock, and to take note of the up-to-date methods of production and

the practical, labor-saving equipment being used on the farm. This publication is issued principally for their use and guidance. The numbers of visitors and the pressure of farm work sometimes make it impossible for each group to be personally conducted over the farm. Most of the buildings, laboratories,

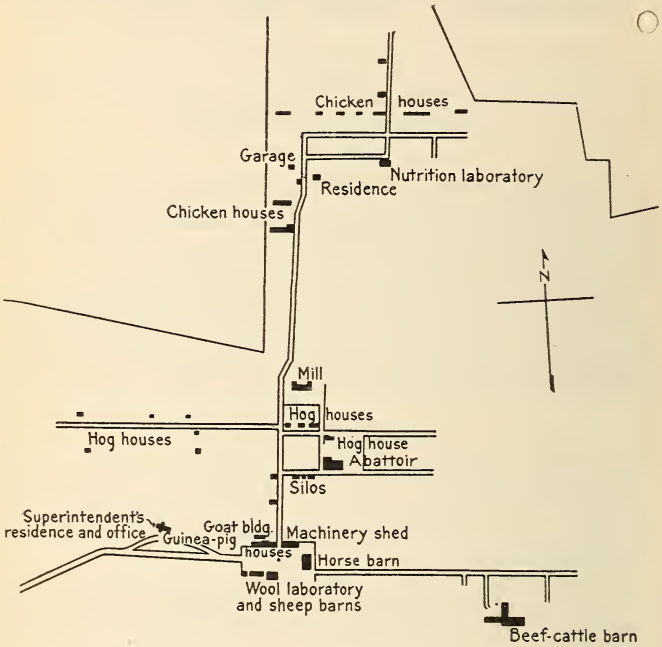

FIGURE 1.—Principal buildings of the U. S. Animal Husbandry Experiment Farm, Beltsville, Md.

and pens will be found open and accessible. Trained employees are generally on hand to explain their portion of the experimental work. In explaining other matters this publication should be of assistance.

LOCATION OF FARM

The farm is about 1 mile east of Beltsville, Md., and 13 miles northeast of Washington, D. C. Beltsville is reached by local

trains on the Baltimore & Ohio Railroad and by motor-bus service over the Washington-Baltimore highway.

REPORTS OF EXPERIMENTS

A number of bulletins giving detailed results of experiments conducted at this farm have been published. Requests for them should be addressed to the Bureau of Animal Industry, United States Department of Agriculture, Washington, D. C., specifying the class of animal in regard to which information is sought.

FIGURE 2.—Four-H Club boys and girls from 39 States listening to an address by Assistant Secretary of Agriculture Dunlap during a visit at the farm

ANIMAL GENETICS

A project dealing with animal genetics is the foundation of all the Government's experiments in animal breeding. It seeks to uncover new principles of improving farm animals by systems of mating, and to test old theories for soundness.

Guinea pigs (fig. 3) are used extensively in this work because of their adaptability to artificial conditions, their frequent litters, and the ease with which they can be handled. Results with these small laboratory animals are checked later with the larger domestic animals.

The effects of inbreeding and crossbreeding form the principal studies. The offspring of one pair of guinea pigs have been inbred by mating brother with sister for 28 generations. The size, longevity, fecundity, resistance to disease, and other characteristics of each generation are carefully recorded and studied. About 1,500 guinea pigs are kept in the laboratory.

Results to date show that inbreeding may be made a potent factor for the fixation of valuable characteristics in animal improvement; but, if practiced in a haphazard manner and without considerable knowledge of the principles involved, the result may be a concentration of undesirable characters and, therefore, inferior animals.

NUTRITION INVESTIGATIONS

Equally as fundamental as the research in animal breeding is that which has for its object the principles underlying animal nutrition. A nutrition laboratory equipped for intensive physiological and biological studies is operated in conjunction with the other lines of work.

The laboratory has been engaged in such studies as the following: The effects of feed on the characteristics of fat deposited in animals, including a cooperative investigation with various

FIGURE 3.—Four generations of inbred guinea pigs. Left to right: Grandparents, great-grandparents, parents, and young

States on soft pork; the protein values of feed for maintenance, growth, and reproduction; the importance of the mineral content of the ration; the changes in composition and color of meat in relation to its quality and palatability; the relation of feed to the rate of growth and development; the quality of goat's milk; the quality of eggs; the physical factors affecting the incubation of eggs; and the growth of wool.

These investigations are conducted jointly with those responsible for other lines of work reported in this publication.

Cooperation with Johns Hopkins University, the American Dental Association, and the United States Egg and Poultry Society, as well as a number of State experiment stations, is maintained in various phases of these investigations.

MEAT INVESTIGATIONS

The ultimate measure of the success of various systems of livestock production is found in the quality and quantity of meat

produced. This fact explains the importance of meat investigations.

A meat laboratory and an experimental abattoir, equipped for the slaughter of cattle, swine, and sheep, with chilling, cutting, and curing rooms, form the principal equipment.

The importance of the project and the extent of interest in it are shown by the fact that, in addition to three bureaus of the Department and other agencies, 25 State stations took part in the work during 1927.

During that year approximately 1,000 cattle were fed out at the various stations in connection with the national cooperative project "A study of the factors which influence the quality and palatability of meat," and 153 representative head of these cattle were studied in the meat laboratory.

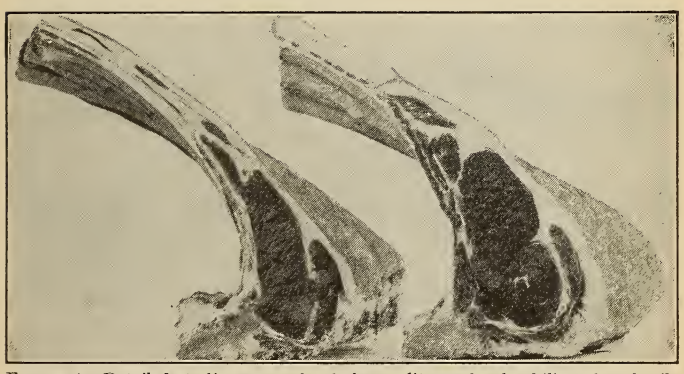

FIGURE 4.—Detailed studies are made of the quality and palatability of such ribs of beef as these to ascertain the effects of different systems of feeding, breeding, and management

Detailed laboratory, cooking, and palatability studies were made on rib samples (fig. 4) from lot representatives of these cattle, as well as on samples from cattle slaughtered at central markets. These observations included physical and chemical analyses, color readings, histological examinations, mechanical tests for tenderness, photographs, and tracings, as well as cooking tests and palatability judging and grading.

A total of 481 lambs were handled last year in connection with the meat project; and complete records, including judging of palatability, were made on 200 of them. The principal factors involved were feed, breed, and castration.

The soft-pork project which is being conducted in cooperation with State experiment stations and swine breeding and feeding

projects in progress at Beltsville furnished 1,278 hogs for study. In addition to the animals owned and fed by the department, 77 shipments of meat and experimental animals were received at the meat laboratory from 19 cooperative State stations.

Experiments with different methods of trimming, handling, and preserving meat under farm conditions are also conducted.

The causes of dark-cutting beef, the relative palatability of grass-fattened and grain-fattened beef, and the relation of age, sex, breeding, and feed to quality and palatability of meat are some of the problems the meat investigations are expected to solve.

FIGURE 5.—Percheron horses are used for much of the field work

HORSE INVESTIGATIONS

Morgan saddle stock is used by the farm superintendent and his foreman for rapid supervision of the farm work.

Percheron horses furnish the horsepower for work in the fields. (Fig. 5.) An economical system is in vogue whereby mares are used for most of the work and also for maintaining the supply by raising colts.

The horses, numbering more than 20 head, are kept principally for utility, experiments with horses being conducted at other points in the United States.

BEEF-CATTLE INVESTIGATIONS

With the addition of more than 1,000 acres of land in 1926, sufficient pasture and grazing land are now available for the conduct of investigations with beef cattle, the results of which will be applicable throughout sections of the eastern half of the United States adapted to beef production.

A nucleus of 25 head of purebred Shorthorns already has been acquired, and the building of a barn is now under way for care of the breeding herd as well as for fattening-cattle experiments.

A project to be begun at an early date is one to determine the relative values of different amounts of protein in the ration of fattening steers, as supplied by linseed or cottonseed meal. Rations having nutritive ratios of 1:5, 1:7, and 1:9, respectively, are to be tried.

Another is a cattle-breeding project in which herd improvement and selection will be based on individual animal efficiency in the utilization of feed, or, in other words, on the ability to convert feed into beef. The final measure will be in terms of quality and palatability as well as quantity of beef.

A project with dual-purpose cattle has been started.

FIGURE 6.—Four-H Club boys and girls listening to a short talk by one of the Government sheepmen

SHEEP-AND-GOAT INVESTIGATIONS

Farm sheep.—About 350 sheep and lambs and a 90-acre tract of well-fenced pasture land known as "Sheep Acres" are used in experiments in farm sheep raising. (Fig. 6.) The department's range sheep investigations are conducted at Dubois, Idaho, and Miles City, Mont.

Sheep of the Southdown, Shropshire, Hampshire, and Corriedale breeds are used in breeding experiments which have for their purpose the type fixing of these breeds.

A system of raising sheep on temporary pastures for the control of parasites is being worked out, utilizing annual forage crops and systematic fencing.

Increasing the number of twin lambs by providing ewes with extra feed at breeding time, commonly called "flushing," is giving promising results. Turning the ewes on to luxuriant pasture just before breeding has resulted, during a period of 11 years, in an average of about 15 more lambs per 100 ewes, each year.

Weekly weighings of all lambs, and biweekly measurements of representative lambs of the various breeds are recorded for use in studies of lamb and wool growth.

Wool.—In a well-equipped wool laboratory, samples of fleeces of both farm and range sheep, grown at many different points in the United States, are analyzed and studied for content of clear wool, grease, and dirt. The primary object is to determine the factors which influence the quantity and quality of wool production.

An attempt also is being made to develop a practical wool-shrinkage test which will enable the grower to measure the approximate quantity of clean wool which his sheep are producing.

Milk goats.—A high-producing herd of milk goats has been developed by breeding Swiss bucks of the Toggenburg and Saanen breeds to native American does. The present herd includes about 60 does and kids, some of which are shown in Figure 7. Studies are being made of the nutritive properties of goat's milk and its value for infant feeding.

FIGURE 7.—Kids of the Saanen and Toggenburg breeds of milk goats

SWINE INVESTIGATIONS

The visitor has an excellent opportunity for studying Uncle Sam's system of hog raising, in which an effort is made to produce pork with a minimum of feed and labor cost, even though the hogs themselves are being grown and fattened as units in highly technical breeding and feeding experiments. (Fig. 8.)

Points of interest are the main farrowing house, where a maximum of sunlight and cleanliness are encouragements to young pigs and discouragements to disease and vermin; the dipping vat, where lice are smothered in crude petroleum or coal-tar

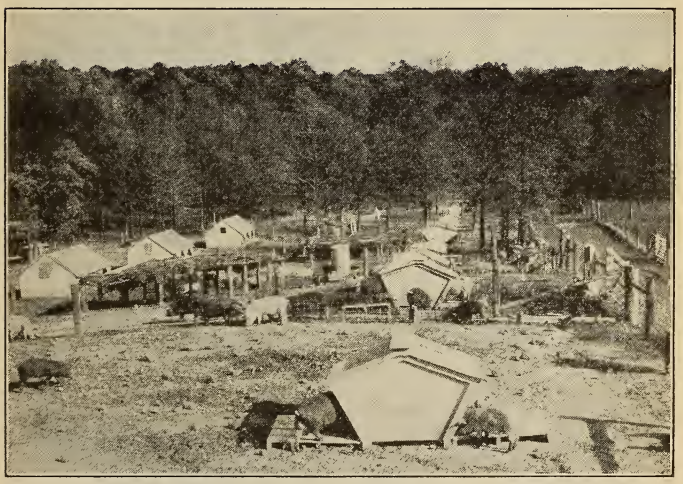

FIGURE 8.—Hog lots where Uncle Sam has worked out a practical system of hog raising

solution; the box-type, portable houses constructed for easy cleaning, for allowing sunshine to enter the interior, and with guardrails to prevent sows from crushing their pigs (fig. 9); the well-arranged hog lots equipped with automatic waterers, artificial shade, self-feeders, and flat-bottomed troughs so constructed that the hogs will neither upset them nor get their feet in them; and the system of pasturing hogs on forage crops.

The principal lines of work are the growing and fattening of hogs on varying proportions of so-called softening and hardening feeds to produce a carcass of the proper degree of firmness; the effects of inbreeding practices with hogs; and the immunization of suckling pigs against hog cholera.

FIGURE 9.—A delegation of swine breeders inspecting the construction of a colony hog house

FIGURE 10.—Experimental pens especially constructed for studies on mineral-deficient rations and their effect on bone development in swine

Results of the immunization work show that age is not a factor in the production of immunity against hog cholera and that suckling pigs may be given the preventive serum treatment as successfully as older pigs.

Other noteworthy results with hogs are those showing the advantages of self-feeding over hand-feeding of sows and litters, and the practical value of fish meal as a protein supplement for growing and fattening hogs.

Slaughter tests and the curing of pork are conducted in the experimental abattoir.

Studies also are being made of different systems of managing brood sows during the gestation period; of the vitamin content of pork; and of the effect of mineral-deficient rations on the bone development of hogs (fig. 10).

POULTRY INVESTIGATIONS

High-laying strains of Rhode Island Reds and Single-Comb White Leghorns are being developed, particular attention being given to the size and shape, as well as the hatchability of eggs from the females that are used as breeders.

An example of the strict system followed is the case of hen No. 3412, which laid 316 eggs from September 12, 1926, to September 11, 1927, and yet was culled because her eggs were below standard size.

Particular attention also is given to reducing chick mortality. In 1927, among the Rhode Island Red chicks on the farm, this was reduced to the point where 98 chicks of every 100 hatched were raised to 4 weeks of age. The figure for Single-Comb White Leghorns was 97.

The inbreeding of Barred Plymouth Rocks and White Leghorns has shown considerable decrease in hatchability of eggs as the inbreeding continues.

Biological studies of hen feathering and inheritance studies of color pattern and comb and crest characters with various breeds are being made.

In poultry feeding, experiments with laying hens are being conducted to determine the effects on egg production of varying amounts of protein in meat scraps and dried skim milk.

Maintenance requirements for White Leghorn hens and the amount of feed needed to produce 1 dozen eggs are being determined.

Other lines of work include: The mineral-balance requirements of growing chicks, especially with respect to calcium carbonate and phosphorus; the influence of sulphur compounds on egg production and molt; vitamin and mineral requirements for egg production in Rhode Island Reds; and a biological study of the relative value of specific feeds for poultry.

A study of incubation takes into account such factors as temperature, moisture content, and chemical analysis of the air in incubators.

A study is being made of the inheritance of a number of characters in poultry, such as egg shape, size, and color, and color of plumage.

About 7,500 chicks are produced each year on the farm. (fig. 11).

FIGURE 11.—Brooder range at the poultry plant

PUBLICATIONS, RELATING TO WORK CONDUCTED AT THE U. S. ANIMAL HUSBANDRY EXPERIMENT FARM, AVAILABLE FOR FREE DISTRIBUTION

Flushing and Other Means of Increasing Lamb Yields. (Department Bulletin 996.)

Some Results of Soft-Pork Investigations. (Department Bulletin 1492.)

Raising Sheep on Temporary Pastures. (Farmers' Bulletin 1181.)

Swine Production. (Farmers' Bulletin 1437.)

Self-Feeding versus Hand-Feeding Sows and Litters. (Farmers' Bulletin 1504.)

Farm Poultry Raising. (Farmers' Bulletin 1524.)

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